

A14-10D

GYPSUM
PARTITION TILE
AND
FIREPROOFING



A14-10D

GYPSUM ASSOCIATION CHICAGO, ILLINOIS

● The purpose of this publication is to present factual data on gypsum tile partitions and gypsum fireproofing. A resume is given of authentic fire tests made upon these constructions and typical details and specifications for gypsum partitions and fireproofing are also included.

Special attention is directed to the specifications for the erection of gypsum partitions and for gypsum fireproofing in the latter part of the booklet. Every effort has been made to cover all the essential steps in the proper erection of gypsum tile and fireproofing so as to obtain good, sound construction. We recommend that they be used in preparing individual specifications. The desirable qualities of gypsum as well as any other good construction material are not obtained unless adequate specifications are prepared and enforced.

Gypsum tile are prepared and manufactured in accordance with Standard Specifications for Gypsum Partition Tile or Block, A.S.T.M. Designation C-52. They are readily available in all parts of the country.

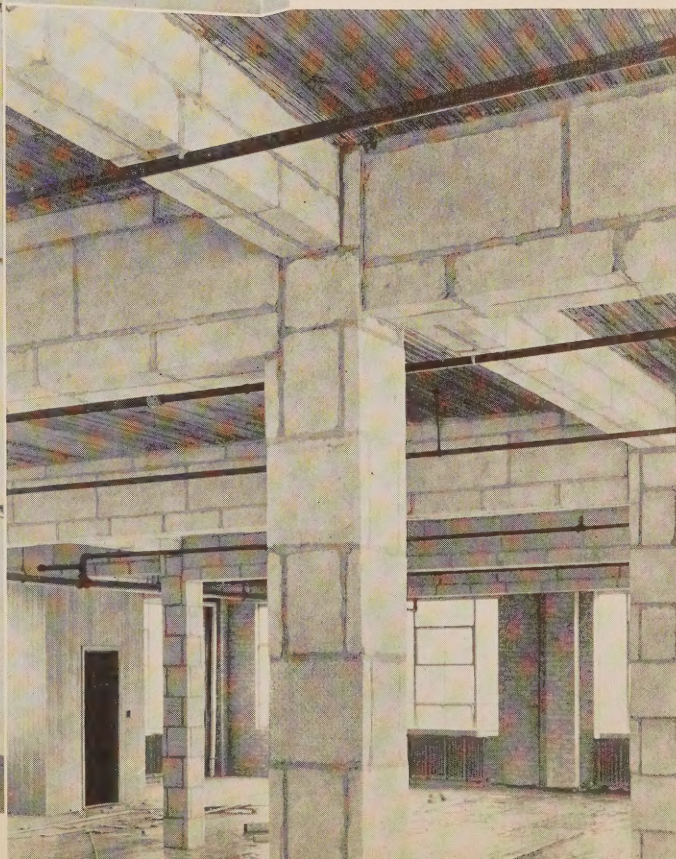
GYPSUM PARTITION TILE AND FIREPROOFING

● Gypsum tile has been used for subdividing and corridor partitions and for shaft enclosures in fireproof and non-fireproof buildings for over thirty years. It is not only incombustible but a 3-inch hollow tile partition, plastered both sides, has a 2-hour fire rating. The same partition unplastered has a fire rating of 1 hour.

The fire-resistance of structural steel protected with gypsum has been determined in fire tests and in practical fire experience. As a result, 2-inch solid and 3-inch hollow gypsum tile and 2-inch poured-in-place gypsum concrete are specifically permitted or approved for fireproofing columns, trusses, girders, and beams in fireproof buildings by building codes, building officials and insurance rating bureaus.

In addition to being fireproof, gypsum tile is lightweight and made in a large, convenient size (12"x30"). Steel molds are used in casting the tile, assuring true, square edges and surfaces. Another important advantage is that gypsum tile can be cut with a large tooth saw to fit practically any job condition. When gypsum tile is used for fireproofing there is less dead weight to be carried, which in turn permits a reduction in the size of steel members. These features of gypsum tile bring about easier and faster erection and assure economical partitions and fireproofing.

● This is a good example of precast gypsum tile column, girder, and beam fireproofing. Note the clean-cut job obtained.





● This photograph shows wood door bucks extending from floor to ceiling, which is in accord with recommended practice, particularly for large openings or where openings occur frequently. When bucks do not extend from floor to ceiling jack-arch or metal lintels are recommended, depending upon the span of the opening.

Door bucks may be equal in width to the total thickness of tile and plaster construction and rabbeted to receive the ends of the tile, or they may be equal to the width of the tile and have grounds nailed to their sides and projecting beyond the buck not less than $\frac{3}{4}$ inch, forming a rabbet to receive the ends of the tile.

Bucks are secured to the ends of the tile partition with corrugated or other approved anchors securely attached to the buck and extending at least 5 inches into the horizontal joints.

For details regarding the bonding of corners and intersections, the proportioning of gypsum mortar and the application of grounds, trim and plastering, see Specifications for the Erection of Gypsum Partition Tile, starting on page 18.

● In the table below, the thickness of the tile only is given; all tile are 12" high and 30" long. The weight of plaster is based upon a thickness of $\frac{1}{2}$ inch over the face of the tile. The mortar requirements are maximum.

TABLE OF WEIGHTS

Thickness and Type of Tile	Weight in Lbs. Per Sq. Ft.	Weight Plastered One Side Per Sq. Ft.	Weight Plastered Two Sides Per Sq. Ft.	Approx. Mortar Requirements per 1000 sq. ft.	
				Lbs. of Gypsum	Cu. Yds. of Sand
$1\frac{1}{2}$ " Split furring tile	5.0	9.0	500	0.625
2" Split furring tile	6.5	10.5	600	0.75
2" Solid	9.5	13.5	17.5	600	0.75
3" Hollow	10.0	14.0	18.0	800	1.00
3" Solid	13.0	17.0	21.0	800	1.00
4" Hollow	13.0	17.0	21.0	900	1.125
5" Hollow	15.5	19.5	23.5	1000	1.25
6" Hollow	16.5	20.5	24.5	1100	1.40

R A P I D , E A S Y E R E C T I O N

● Gypsum tile partitions are rapidly and easily erected for the following reasons:

LARGE UNITS. Gypsum tile has face dimensions of 12"x30", each unit laying-up 2½ square feet of partition.

TRUE, SQUARE EDGES AND SURFACES. Gypsum tile are cast in steel molds or forms, assuring true, square edges and surfaces and accurate dimensions.

LIGHT-WEIGHT. 3- and 4-inch hollow gypsum tile, for example, weigh 10 and 13 pounds per square foot, respectively.

EASY TO HANDLE. The light-weight of gypsum tile, their true, square edges and surfaces, and accurate dimensions make them easy to handle and to obtain a straight and plumb partition with the minimum amount of effort and time.

CAN BE CUT WITH A SAW. Gypsum partition tile can be easily cut with a 3 point, 28" plaster saw to fit openings, to form pipe chases, to allow for conduits, and in fact to meet practically any job condition.

REQUIRES LESS MORTAR. There are 40 per cent less joints in a partition constructed of gypsum tile than in a partition composed of units having 1 square foot of partition surface. This means a saving in the amount of mortar required and in erection.

SAVES PLASTER. The minimum amount of plaster is required over gypsum tile because of the true, square edges and surfaces and the straight and plumb partitions obtained with them.

GROUND AND FIXTURES READILY ATTACHED. Light trim, such as picture molding, may be toe-nailed directly into gypsum tile with cut nails. Ordinary trim, such as baseboards, chair rails, etc., may be secured to grounds or to nailing blocks. The nailing blocks are not less than ⅞ inch thick, as wide as the tile, and 12 inches high. The blocks are nailed directly to the ends of the tiles with cut nails and these tiles are then built directly into the partition. The nailing blocks are, therefore, approximately 30 inches on centers and to these a continuous ground can be nailed. For the attachment of heavy fixtures, gypsum tile can

be readily and accurately cut on the job to 15-inch lengths (in half) providing for 1½ inch nailing blocks 15 inches on centers.

Where kitchen sinks and similar fixtures are to be attached to gypsum tile they may be readily secured by bolting through the partition.

THE OPINION OF USERS

Letters from users of gypsum tile partitions are reproduced in this publication. They are typical replies to our inquiry as to their experience with this type partition and their frank opinion of its qualities. Space does not permit reproducing all the letters so we present excerpts from several of them:

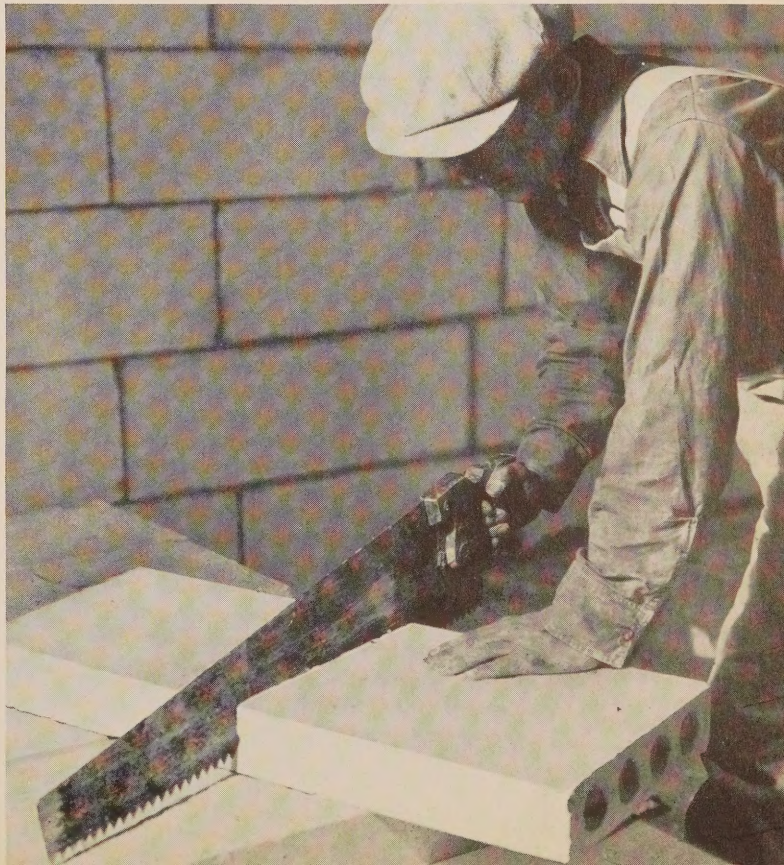
"In building a partition or wall it sets up very readily and can be plastered and finished in much less time * * * *"

M. H. TERRY, *Manager*
ROYAL YORK APARTMENTS
COLUMBUS, OHIO

"We have from time to time used a considerable amount of gypsum tile partitions and it is our opinion that this type of partition is much more quickly erected * * * *. One of the advantages gypsum tile has over the majority of materials is its lightness."

P. L. BURCH
Supervisor of Physical Plant
UNIVERSITY OF NORTH CAROLINA
CHAPEL HILL, NORTH CAROLINA

● Gypsum tile may be sawed with a 3 point, 28" plaster saw to fit exact dimensions. The sawed edges are even and clean-cut and the tile is uninjured. There is no waste, since small sections of tile remaining may be used to fill in openings after conduits, pipes, etc., are in place. Gypsum tile is easily tailored to fit.



READILY ALTERED

● In some occupancies, such as large hotels and office buildings, partitions are altered a number of times each year to rearrange floor space. In order to do this with the minimum amount of expense and inconvenience it is necessary that the partitions used be capable of being readily altered. Gypsum tile partitions meet this requirement admirably because they are readily cut with a large tooth saw. New openings may be cut in a gypsum tile partition or a section or entire partition may be removed with the minimum amount of labor and time. New openings have such clean-cut edges that very little, if any, patching of the plaster surrounding the openings is necessary. Oftentimes the new trim covers what little plaster may have been chipped off at the edges.



THE REAL ESTATE CORPORATION

ESTABLISHED 1891
343 SOUTH DEARBORN STREET
CHICAGO
INCORPORATED 1923
TELEPHONE HARRISON 4040

H. EDSALL OLSON
THOMAS NASH
—
CHARLES A. OLSON
1891-1937

PROPERTY MANAGEMENT
TIMES BUILDING
FRANKLIN BUILDING
WINTERBOTHAM BUILDINGS
KNOTT BUILDINGS
MONON BUILDING
LOWELL BUILDING
LAW BUILDING
GIRARD BUILDING
ORR PROPERTIES
RAND McNALLY BUILDING
FAIRBANKS MORSE BUILDING
WOODS BUILDING

October 6, 1939

Gypsum Association
211 West Wacker Drive
Chicago, Illinois

Gentlemen:

I have used your gypsum tile among other products for partitions in the remodeling and installation of new offices, and due to the ease of erection, low labor cost and the facility of handling gypsum tile, I now specify it in all alteration and erection jobs. It lends itself more readily than any other material that I have found to alteration due to the ease of removing old walls and cutting openings in walls already erected.

Gypsum tile is also sound-proof from any air-borne sounds. It is an excellent base for plaster and in my experience I have found no shrinkage or cracking which would necessitate any maintenance cost. In a word, I am more than satisfied with gypsum tile.

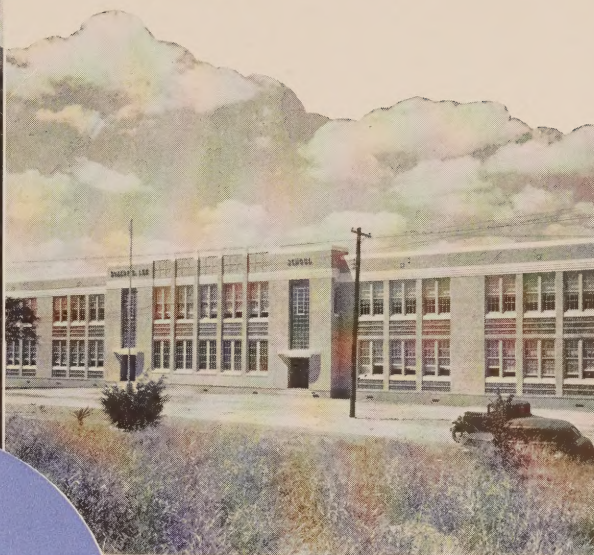
Very truly yours,

THE REAL ESTATE CORPORATION

Wm. H. Van Hoesen, Pres.

Wm. H. Van Hoesen

WVH/AC



ROBERT E. LEE
SCHOOL—
AUSTIN, TEXAS
GIESECKE & HARRIS
and R. L. THOMAS,
ARCHITECTS



ROCKEFELLER CENTER OFFICE BLDG.
NEW YORK CITY

REINHARD & HOFMEISTER; HARRISON
& FOUILLOUX; and CORBETT &
MACMURRAY, ARCHITECTS.
Photo by Robt. M. Damora

● The buildings shown on this page used gypsum tile for interior, non-bearing partitions. Rockefeller Center Office Building and the Field Building are good examples of buildings in which it is necessary to alter partitions quite often to meet the changing needs of the tenants.

The letter from the Real Estate Corporation reproduced on the opposite page is self-explanatory. However, special attention is directed to the statement that gypsum tile "lends itself more readily than any other material that I have found to alteration due to the ease of removing old walls and cutting openings in walls already erected."

The following statements which we have received are also pertinent and of interest.

"Simple and quick."

H. B. IGLEHART, *Engineer*
BOARD OF EDUCATION
AUSTIN, TEXAS

"Gypsum walls too lend themselves very nicely to alterations."

R. M. ROTHGEB, *Engineer*
UNEMPLOYMENT COMPENSATION OFFICE BLDG.
RALEIGH, NORTH CAROLINA

FIELD OFFICE BLDG.
CHICAGO

GRAHAM, ANDERSON, PROBST
and WHITE, ARCHITECTS

FIREPROOF

● The ideal fireproofing material must possess the following four essentials:

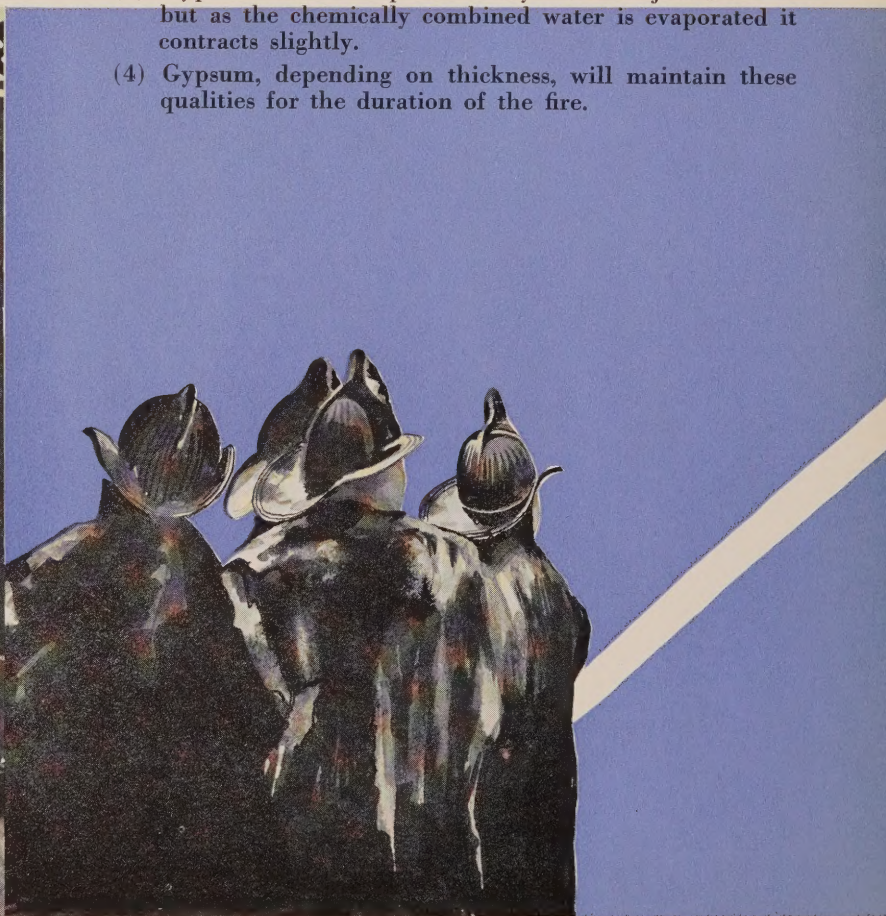
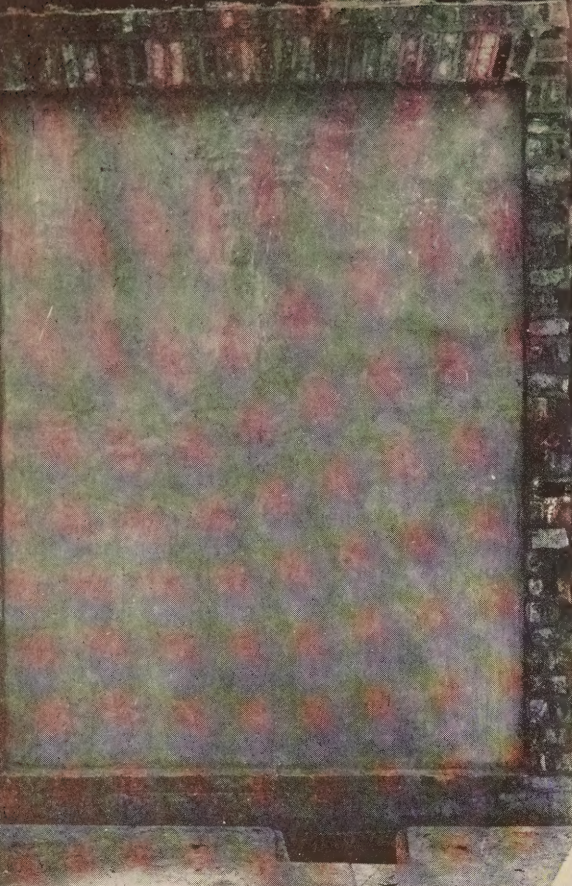
- (1) It must not burn;
- (2) It must not transmit heat at high temperatures;
- (3) It must not expand unduly;
- (4) It must maintain the first three qualities for the duration of the fire.

The ideal fireproofing material from every standpoint but one is ice. Ice will not burn; ice will not transmit heat; heat cannot pass through ice because ice can not be heated above 32° F. and remain ice; ice does not expand when subjected to fire, on the contrary, it melts.

Ice will not maintain these essentials for the duration of the fire and there is where it fails to be an ideal fireproofing material.

Gypsum, however, possesses all four essentials:

- (1) Gypsum will not burn; it is a rock and can not burn regardless of the degree of heat to which it may be subjected.
- (2) Gypsum will not transmit heat at high temperatures. Just as it is impossible to heat ice above 32° F. so it is impossible to heat gypsum above 212° F. This is because as gypsum calcines it gives up its chemically combined water and as water can not be heated above 212° so gypsum can not be heated above that temperature until all the chemically combined water has been evaporated.
- (3) Gypsum will not expand unduly when subjected to fire but as the chemically combined water is evaporated it contracts slightly.
- (4) Gypsum, depending on thickness, will maintain these qualities for the duration of the fire.

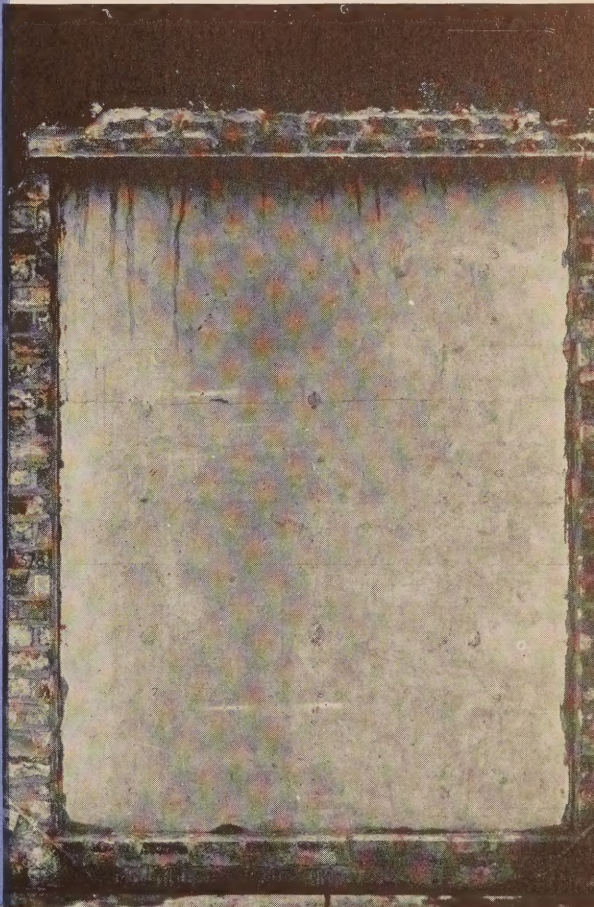
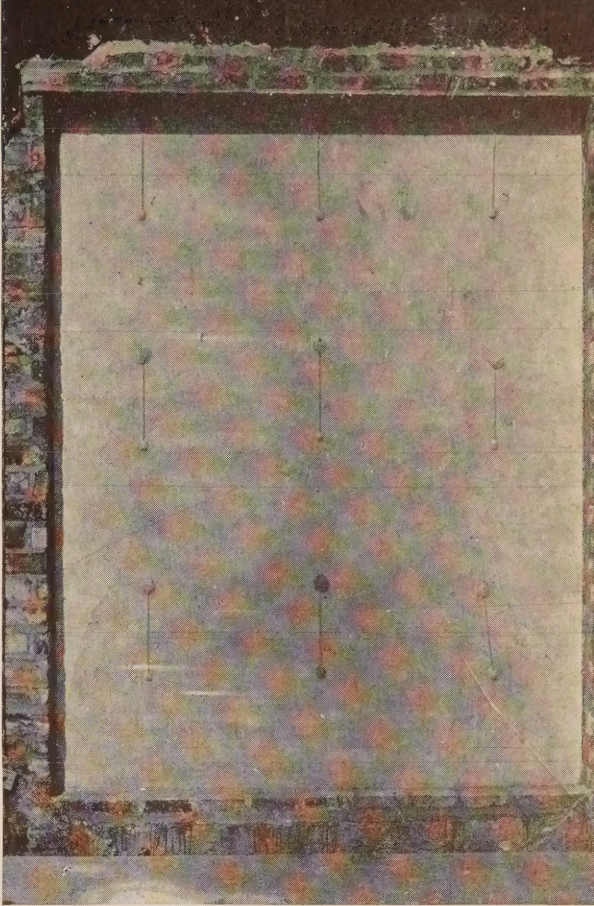


BY TEST

Not less than 36 fire and water tests have been conducted on gypsum tile partitions. Eighteen of these tests were made for the New York Bureau of Buildings at Columbia University, New York City. The Underwriters' Laboratories, Chicago, have made 11 tests and the British Fire Prevention Committee, 7. All these tests have demonstrated the excellent fire-resisting properties of gypsum.

A representative test on a gypsum tile partition was reported by the Underwriters' Laboratories in Retardant Report No. 378. This test was made on a 3-inch hollow gypsum tile partition plastered both sides with $\frac{1}{2}$ inch gypsum plaster. The partition was subjected to a fire for 2 hours, the temperature for the last $1\frac{1}{2}$ hours being approximately 1700° F. The partition was then subjected to a hose stream test at 50 pounds pressure for a period of 5 minutes. The temperature on the unexposed side of the partition (away from the fire) at the end of the test was 166° F. This indicated a rise in temperature of only 90° F., since the original room temperature was 76° F. At the end of the test the partition had passed neither fire, smoke, nor water.

As a result of these tests, 3-inch hollow gypsum tile non-bearing partitions are rated as 2-hour fire-resistive when plastered both sides with $\frac{1}{2}$ -inch gypsum plaster and 1-hour fire-resistive when unplastered, by building codes, both municipal and national. These partitions are rated as 2-hour and 1-hour fire-resistive in the report of the Department of Commerce Building Code Committee, "Recommended Minimum Requirements for Fire Resistance in Buildings."



● The photograph at the top of the opposite page was taken before the fire test and shows the exposed side of the plastered 3-inch hollow gypsum tile partition panel tested by the Underwriters' Laboratories and reported by them in their Retardant Report No. 378. This photograph and the others shown on these pages are not retouched.

● The lower photograph on the opposite page shows the exposed side of the panel after 2 hours' fire exposure. It should be borne in mind that the temperature during the last $1\frac{1}{2}$ hours of the fire was about 1700° F.

● The unexposed side of the test panel before the fire test is shown above with the thermometers to measure the temperatures in place. Lines along which deflections were measured are also shown.

● The lower photograph shows the unexposed side of the panel after 2 hours' exposure to the fire. The partition passed neither fire, smoke, nor water.

SOUND INSULATION

● Gypsum tile partitions provide satisfactory sound insulation. This has been proved by experience and the results of sound insulation tests conducted by nationally recognized testing laboratories.

In writing to building managers, superintendents, and maintenance engineers for their opinion of gypsum tile partitions, we requested information upon their sound-insulation efficiency. The replies received indicate that gypsum tile partitions are efficient barriers to the transmission of sound. The letter reproduced on the opposite page from the Detroit Board of Education is a good example of the comments received. Such opinions are the most convincing proof of their sound insulation value.

● Sound insulation is important in hotels.

The Edgewater Beach has one thousand rooms. It is located on the north side of Chicago and is one of the city's largest hotels.

EDGEWATER BEACH HOTEL
ON THE LAKE 5310 SHERIDAN ROAD
CHICAGO, ILLINOIS

PHONE LONG BEACH 8000



PRIVATE OFFICE
WILLIAM M. DEWEY
MANAGING DIRECTOR

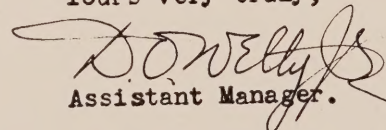
October 16, 1939.

Gypsum Association,
211 West Wacker Drive,
Chicago, Illinois.

Gentlemen:

During all of the years of operation of the Edgewater Beach Hotel we have used gypsum tile in making room partitions, and in practically all of our remodeling work requiring plastered walls. Gypsum tile provides an easy method of forming walls; and also where a door is to be cut in the wall it is a simple matter to cut through the tile. We have not experienced any maintenance trouble on any of these walls.

Yours very truly,


Assistant Manager.

DOW:ERF



ECONOMICAL

● In addition to being fireproof and providing good sound insulation, gypsum tile partitions are economical. The users of gypsum partitions have given us many reasons for the economies obtained, the most important of which are:

- (1) Rapid and Easy Erection
- (2) Fewer Mortar Joints—Less Mortar
- (3) Saving in Plaster due to Smooth, Square Surfaces and Accurate Dimensions
- (4) Grounds, Trim, and Fixtures are Readily Attached
- (5) Easily Altered

BOARD OF EDUCATION
DETROIT, MICHIGAN
DEPARTMENT OF BUILDING AND GROUNDS

October 10, 1939

Gypsum Association
211 West Wacker Drive
Chicago, Illinois

Gentlemen:

In reply to your recent inquiry, we make the following comments regarding gypsum tile partitions:

- (1) There is no difficulty in erection.
- (2) These partitions are easy to maintain.
(Practically none)
- (3) They are easily removed and easily reerected.
- (4) There are no difficulties in sound insulation.
- (5) These partitions have stood up very well in cases of fire.

I trust this information will be of service to you.

Very truly yours,

Geo. L. W. Schulz

George L. W. Schulz,
Assistant Director

GLWS:B

● The City of Detroit has many splendid school buildings built under the direction of the Board of Education. Their comments on gypsum tile partitions are therefore of special interest.



G Y P S U M

THE PURPOSE OF FIREPROOFING. Structural steel is fireproofed to insulate it against an undue increase in temperature when subjected to fire conditions. With a working stress of 18,000 pounds per square inch and a temperature of 1000° F., the ability of steel to sustain loads is seriously impaired. Therefore, steel must be insulated against this rise in temperature. If the fireproofing performs this function for the desired length of time, it is immaterial whether it is in contact with the metal or whether there is an air space between the steel and the protective covering.

GYP SUM FIREPROOFING. Fire tests conducted upon 2-inch solid and 3-inch hollow gypsum tile, plastered, without backfill, and upon 2-inch poured-in-place gypsum fiber concrete fireproofing have proved

them capable of insulating structural steel against critical temperatures for over 4-hours' time with an ample factor of safety. Four hours' fire protection is the maximum required by modern building codes and ordinances.

APPROVED BY BUILDING OFFICIALS. Based upon the results of these tests and upon experience with gypsum in actual fires, these gypsum protections are specifically permitted or approved for fireproofing structural steel members in fully-fireproof buildings by building codes, building officials, and insurance rating bureaus. A good example of the recognition given gypsum is contained in the Department of Commerce Building Code Committee's Report "Recommended Minimum Requirements for Fire



FIREPROOFING

Resistance in Buildings" in which gypsum fireproofing of the thicknesses mentioned previously are listed as 4-hour fire-resistive protection for columns, beams, girders, and trusses.

LESS DEAD WEIGHT. Poured-in-place gypsum—gypsum fiber concrete—weighs 55 pounds per cubic foot. Precast gypsum tile—2-inch solid and 3-inch hollow—weigh 10 pounds per square foot. These protections reduce considerably the dead load carried by columns and footings and permit the use of smaller structural members.

EASIER AND FASTER ERECTION. Because (1) The tiles are easily cut and fitted on the job. (2) Shoe and soffit tiles made to fit beam flanges. (3) Plaster applied with minimum amount of material and time.

ADVANTAGES

- (1) A minimum of 4 hours' fire protection
- (2) Less dead weight—permits reduction in size of steel members
- (3) Easier and faster erection
 - (a) Light-weight
 - (b) Easy to cut with a saw
 - (c) Accurate surfaces and dimensions—left unplastered, if desired
 - (d) Good plaster base—eliminates waste
- (4) Shapes to fit lower flanges of steel beams and special conditions.



FIRE TESTS OF COLUMNS PROTECTED WITH GYPSUM

The fire-resistance of steel columns protected with 3-inch hollow and 2-inch solid precast gypsum tile and 2-inch poured-in-place gypsum concrete fireproofing was determined in a series of fire tests conducted at the Bureau of Standards, Washington, D. C., February, 1930 and May, 1931. These tests were conducted in accordance with the American Society for Testing Materials Tentative Specifications for Fire Tests of Building Construction and Materials (C19-26T). The results were published in Research Paper No. 563, which is part of Bureau of Standards Journal of Research, Volume 10, June, 1933. The title of the paper is "Fire Tests of Columns Protected with Gypsum."

The columns were loaded to their design capacity in accordance with the American Institute of Steel Construction column formula. The effective length of the columns was 10'-4", and the temperatures of each column were indicated at 10 points by iron-constantan thermocouples inserted into the steel column shaft.

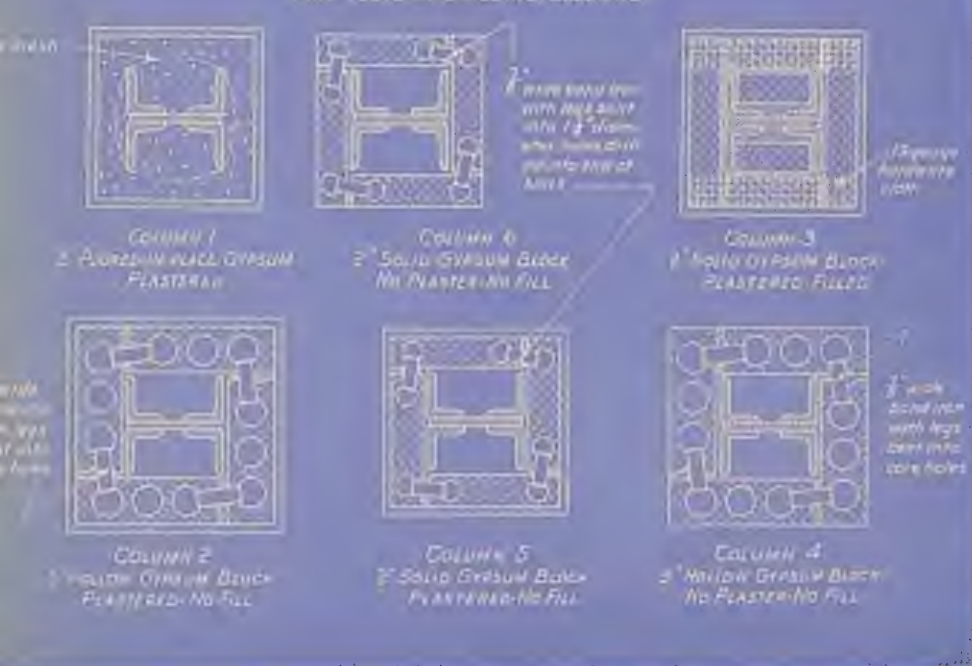
The details of the gypsum coverings and the results of the tests in hours and minutes to failure of the six columns tested are shown below.

Column No. 1 was protected with poured-in-place gypsum concrete composed of 87½ per cent gypsum and 12½ per cent wood chips, by weight. The column was first wrapped with a wire fabric consisting of No. 14 gage wires, 4-inch mesh. Columns Nos. 2 to 6, inclusive, were protected with precast coverings which were cut to 15-inch lengths and placed on end.

Two methods of anchoring the precast coverings were employed. In columns 2, 4, 5, and 6, the tile were anchored by means of ⅞-inch, No. 12 gage cramps or strips of band iron bent into the shape of a U-hook, with the legs projecting 2 inches into the hollow core holes. In columns 5 and 6, protected with 2-inch solid gypsum tile, 1¼-inch diameter holes were drilled 1 inch into the top ends of the tile. The tile in column No. 3 were tied together by means of wire cloth strips cut from 19 gage, galvanized hardware cloth, having 2 meshes per inch, which were placed in the horizontal joints. Column No. 3 was the only one in which back-filling was employed.

The precast gypsum tile protections were set in gypsum mortar, consisting of 1 part gypsum to 3 parts sand, by weight. In general the vertical and horizontal joints were ⅜ inch thick. Columns 1, 2, 3, and 5 were

DETAILS OF GYPSUM FIREPROOFING
FIRE TESTS OF BUILDING COLUMNS



RESULTS OF TESTS

Fire Resistance of Columns with
Gypsum Protective Coverings:

Col. No.	Construction Details	Time to Failure Hr:Min.
1	Monolithic 2-inch poured-in-place gypsum fiber concrete with ½-inch sanded gypsum plaster.....	6:54
2	3-inch hollow gypsum tile with ½-inch sanded gypsum plaster. No fill.....	5:10
3	2-inch solid gypsum tile, filled solid. ½-inch sanded gypsum plaster.....	5:47
4	3-inch hollow gypsum tile. No fill, no plaster.	2:52
5	2-inch solid gypsum tile, no fill. ½-inch sanded gypsum plaster.	4:21
6	2-inch solid gypsum tile. No fill, no plaster.....	2:33

plastered with gypsum plaster composed of 1 part gypsum to 3 parts sand, by weight. Plaster was applied in the usual "double-up" method, the second coat being applied immediately after the first coat. The usual lime-putty finish was then applied.

TEMPERATURES OF THE STEEL COLUMNS

The temperature chart shows the temperature progress in the steel column in the test on Column No. 1, protected with 2-inch poured-in-place gypsum concrete plastered with $\frac{1}{2}$ inch of gypsum plaster.

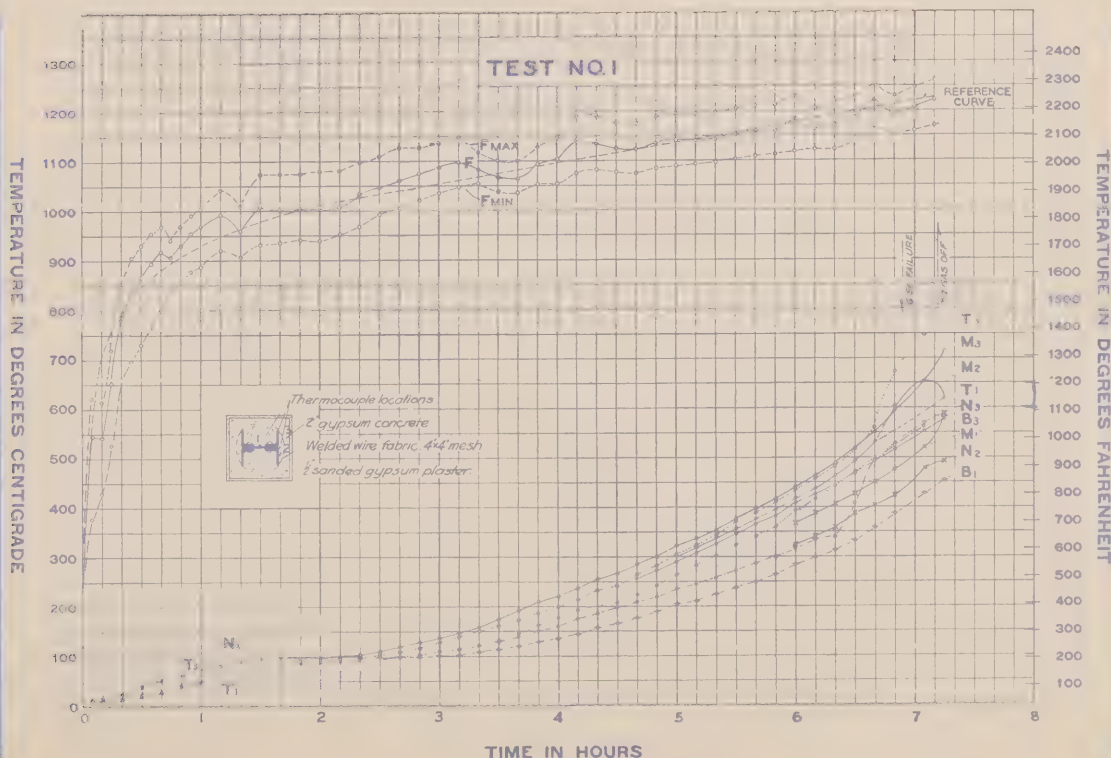
The upper curves in the chart represent the furnace temperatures and the lower curves the temperature of the steel column at various locations. Thermocouples were placed on the web plate at the center of the column, on the edge of the plate at the flange of the column, and on the outstanding leg of the column. The temperature of the steel was recorded at these points at four elevations. This chart clearly illustrates the lag in temperature that takes place at 212° F.

The approximate average temperature of column No. 1, at 2 hours was 212° F.; at 3 hours, 250° F.; at 4 hours, 350° F.; at 5 hours, 500° F.; at 6 hours, 700° F.; and at 6 hours and 54 minutes, when failure occurred, 1000° F. At this time, the furnace temperature was approximately 2250° F. It should be noted that a considerable portion of the plaster on this column fell off during the first part of the test. The

character of the gypsum concrete surface left by the oiled wooden forms may have been responsible for the plaster spalling.

In the test on Column 2, protected with 3-inch hollow gypsum tile without backfill plastered with $\frac{1}{2}$ inch gypsum plaster, the temperature record of the steel between 1 and 3 hours was not obtained. The temperatures for this period did not register because of a short circuit in the thermocouple wires caused by the condensation of steam released by the calcination of the gypsum tile. At 5 hours and 10 minutes, when failure occurred, the average temperature of the furnace was about 2075° F., and the average column temperature indicated was approximately 850° F. This apparent low temperature was due to the thermocouples still being partially affected by the steam. The thermocouples were registering about 200° F. low.

The temperature of the steel in Column No. 5 protected with 2-inch solid gypsum tile, without backfill, plastered with $\frac{1}{2}$ inch gypsum plaster, did not get much above 212° F. during the first 2 hours, which phenomenon was observed in the other tests. The temperature then rose slowly until at 3 hours it was approximately 485° F.; at 4 hours, 860° F.; and at 4 hours and 21 minutes, which was the time to failure, the approximate average temperature of the steel was 1025° F. The furnace temperature at this time was approximately 2000° F.

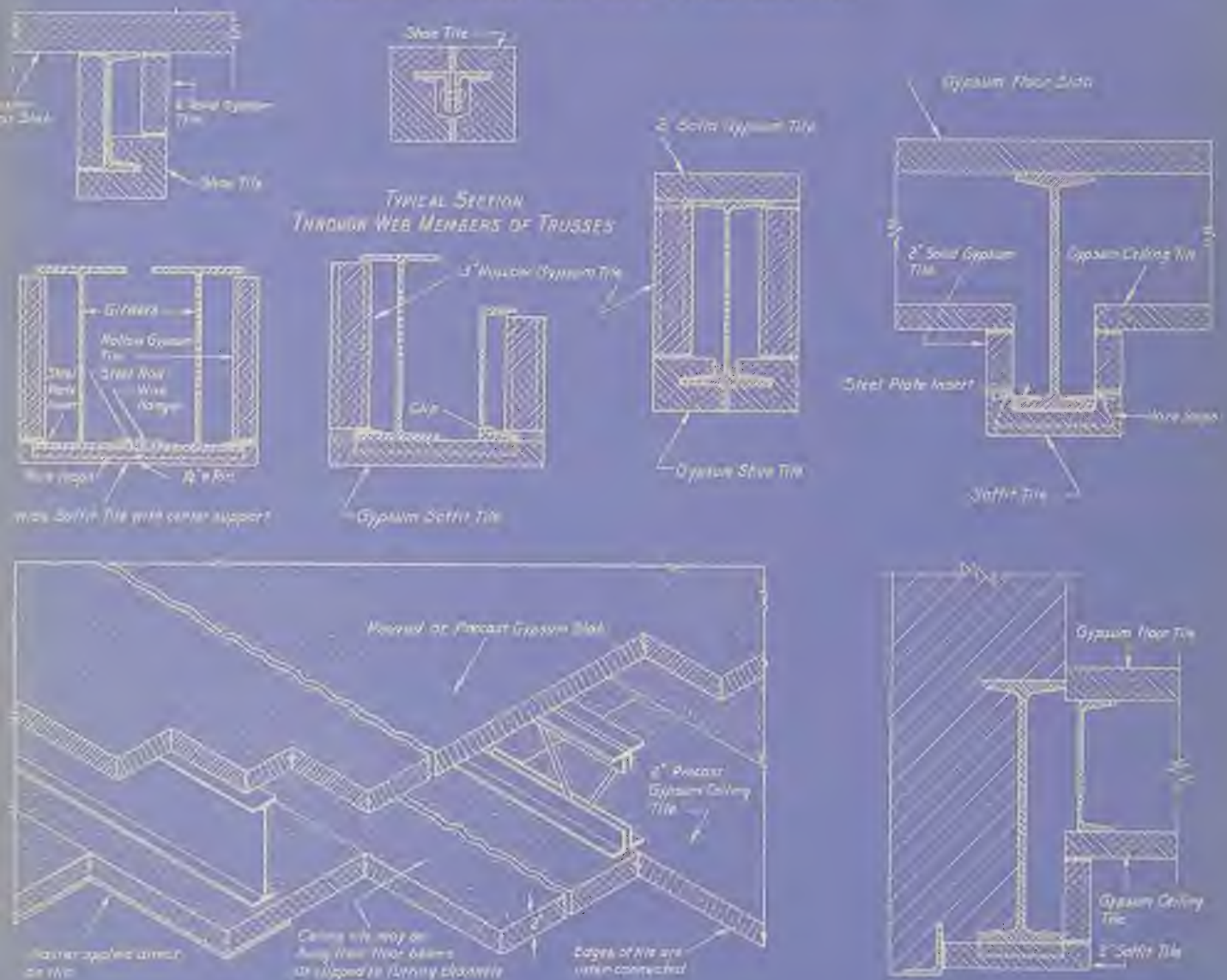


BEAM AND GIRDER FIREPROOFING

● In 1922, 1926, and 1930, fire tests were conducted at Columbia University, New York City, on poured-in-place and precast gypsum floors and ceilings on steel supports. These tests were made in accordance with the fire test requirements of the New York City Building Code. In the 1922 and the 1930 tests, the fireproofing for the steel supports consisted of 2-inch precast gypsum ceiling slabs; in the 1926 test, a 2¼ inch poured-in-place gypsum ceiling was used. All three floors successfully passed the test requirements for 4-hour fire-resistive floors.

The average furnace temperature for the 4 hours was 1732° F. in the 1922 and 1926 tests and 1689° F. in the 1930 test. The maximum temperature of the air space between the floor and ceiling slabs at the end of 4 hours was 315° F. in the 1922 test. The maximum temperature of the lower flanges of the supports was 205° F. in the 1926 test and 241° F. in the 1930 test.

TYPICAL DETAILS GYPSUM FIREPROOFING



2" PRECAST GYPSUM CEILING TILE FIREPROOFING

DETAIL OF SPANDREL GIRDER COVERING

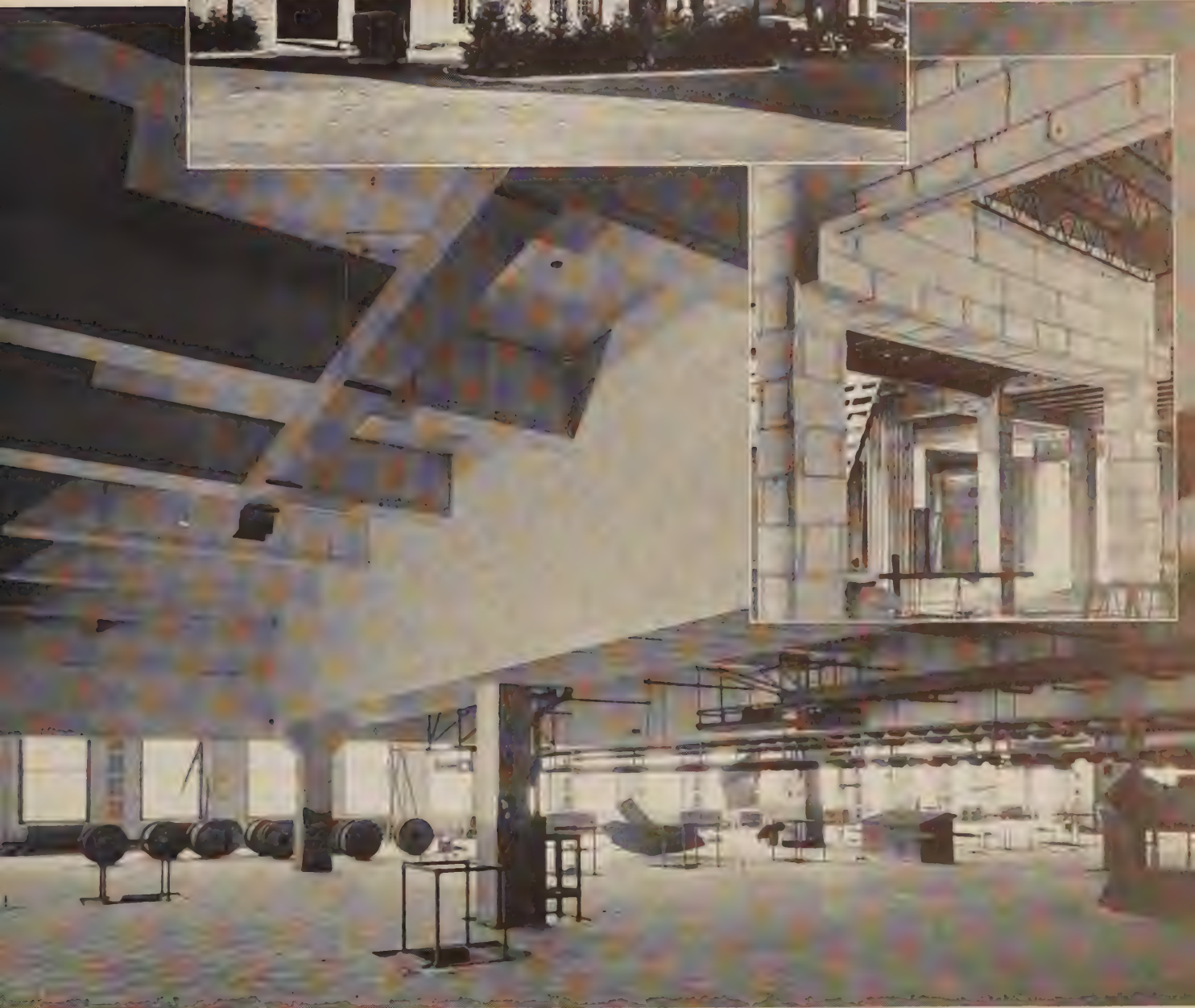
TYPICAL INSTALLATIONS



● Hudson House, Ardsley-on-Hudson, New York
Shreve, Lamb & Harmon, Architects, New York City
Photo by Schnall

● (Small picture—below)
Queen's Park Hotel
Toronto, Canada
H. G. Holman, Architect

● (Large picture—below)
Chicago, Illinois, Post Office
Graham, Anderson, Probst & White, Architects



SPECIFICATIONS

FOR THE ERECTION OF GYPSUM PARTITION TILE

1. GENERAL—Permanent partitions and furring shall be started on the rough floor. Partitions of a temporary nature or that may be moved from time to time shall be started on the finished floor. Tile courses shall not be started upon frozen concrete nor upon cinder concrete when such is used for the purpose of fill only. Gypsum tile shall be stored in a dry location until ready for use.

2. PARTITIONS—Partitions shall be laid with vertical joints broken and shall extend from floor to ceiling. They shall be set plumb, straight and true, and shall be wedged at the ceiling, and the joints slushed with gypsum mortar.

3. ANCHORS—(To be placed in Masons' Specifications.) Partitions intersecting brick, or other masonry walls, shall be securely anchored to such walls by means of corrugated or other approved anchors furnished and set by the masonry contractor approximately $12\frac{1}{4}$ inches on centers so that they will project in the joints of the partition not less than 5 inches.

4. CORNERS AND INTERSECTIONS—Partitions shall be bonded at the corners and intersections by overlapping alternate courses back and forth (log cabin fashion).

5. FURRING—Gypsum tile furring shall be laid as is herein required for partitions. Furring in contact with the construction shall be securely anchored to the masonry by means of 10 penny steel cut nails driven into the masonry joints at intervals not greater than every two feet horizontally and vertically, or shall be securely anchored by metal ties or

other approved methods for securing furring to masonry. Free standing furring shall be of not less thickness, nor of greater height, than shown in the table below.


6. HEIGHT—The clear height of non-bearing partitions of gypsum tile shall not exceed the following:

Nominal Thickness of Tile		Maximum Height
2 inch Solid	Partition or Enclosure	10 feet
3 inch Solid	Partition or Enclosure	15 feet
3 inch Hollow	Partition or Enclosure	13 feet
4 inch Hollow	Partition or Enclosure	17 feet
5 inch Hollow	Partition or Enclosure	20 feet
6 inch Hollow	Partition or Enclosure	30 feet

7. WOOD BUCKS AND METAL DOOR FRAMES—(To be placed in Carpenters' Specifications.)

(a) Wood Bucks—Where wood bucks are used they shall be of not less than 2-inch nominal thickness and of a width equal to the total thickness of the tile and plaster construction. They may be rabbeted to receive the ends of the tile, or they may be of a width equal to the thickness of the tile only, with $\frac{1}{2}$ -inch grounds nailed to their sides and projecting beyond the buck not less than $\frac{3}{4}$ inch, forming a rabbet to receive the ends of the tile.

(b) Metal Door Frames—All metal frames shall be leveled and shimmed and kept in alignment by adequate bracing. Such frames shall be se-



curely fastened to rough or finished floor with suitable bolts.

Gypsum tile shall extend into the frames and be properly anchored. All frames shall be re-checked for plumbness after the tile is in place.

- (c) All wood bucks and metal door frames shall be secured to the ends of the tile partition with corrugated or other approved anchors nailed or otherwise securely attached to the buck or frame and extending at least 5 inches into every horizontal joint.

NOTE—In partition construction, regardless of the material employed, the frequency of openings and their size and height are factors that should receive consideration when designing, since all openings tend to weaken the construction. When wood bucks are used it is recommended that they extend from floor to ceiling.

8. LINTELS

- (a) BUILT UP—Openings in gypsum tile partitions which are not more than 22 inches in width shall be spanned by a gypsum tile which shall have a bearing at each end of not less than 4 inches. When such openings are more than 22 inches but not more than 4 feet in width the gypsum tile over the openings shall be laid in the form of a jack arch. The skew-back tile shall have a bearing on the jambs of not less than 12 inches nor shall they be set so as to project beyond the face of the jambs to a distance greater than one-half of the bearing.
- (b) METAL—Openings in partitions of gypsum tile which are more than 4 feet in width shall be spanned by

metal lintels of approved design. They shall be of such form as to provide a distributed and uniform bearing upon the supporting construction and shall provide a bearing of not less than 6 inches at each end. Metal lintels shall be furnished by the steel contractor but set by the partition contractor. (This same paragraph should be inserted in the steel specifications.)

9. MORTAR—Gypsum tile construction shall be laid-up with a mortar composed of 1 part gypsum to not more than 3 parts of clean, sharp sand, by weight. Gypsum mortar shall not be retempered.

10. PLASTERING—(To be placed in Plasterers' Specifications.) Plastering on gypsum tile shall be done with gypsum plaster applied in accordance with the American Standards Association Standard Specifications for Gypsum Plastering.

All joints between gypsum tile and other masonry construction shall be covered with a strip of metal lath not less than 12 inches in width, weighing not less than 2.2 pounds per square yard.

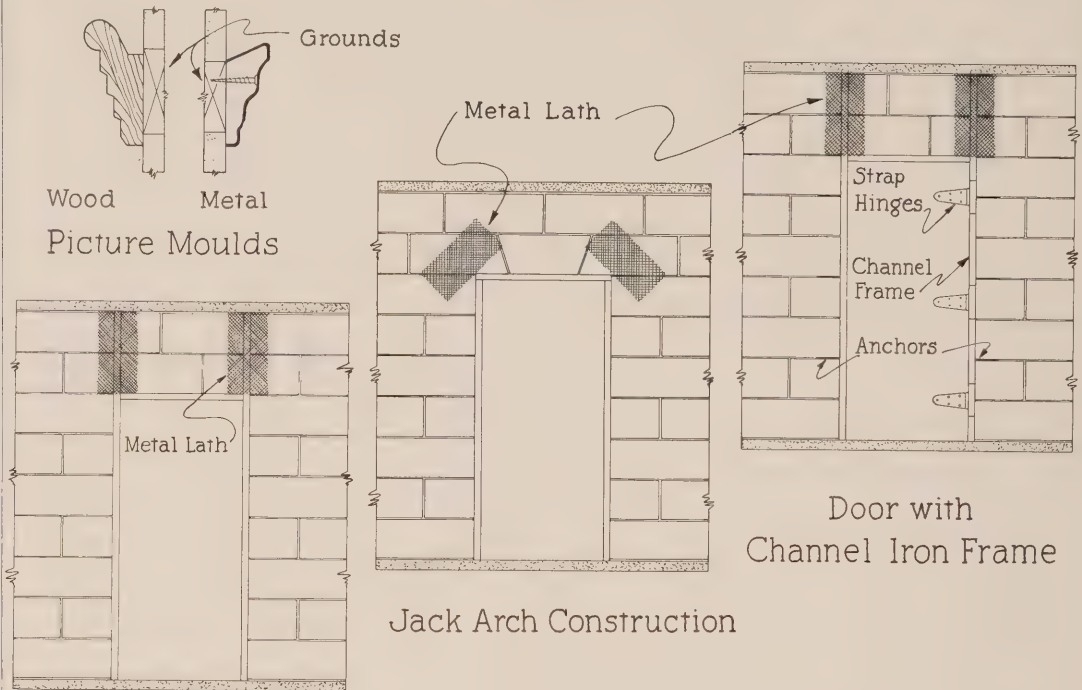
When bucks extend from floor to ceiling that portion of the buck above the opening shall be covered with a strip of metal lath not less than 12 inches in width, weighing not less than 2.2 pounds per square yard.

When bucks do not extend from floor to ceiling a strip of metal lath 12 inches wide and not less than 2 feet long weighing not less than 2.2 pounds per square yard shall be attached to each side of the partition on both sides of the opening. This strip shall run diagonally across the head of the opening over the buck.

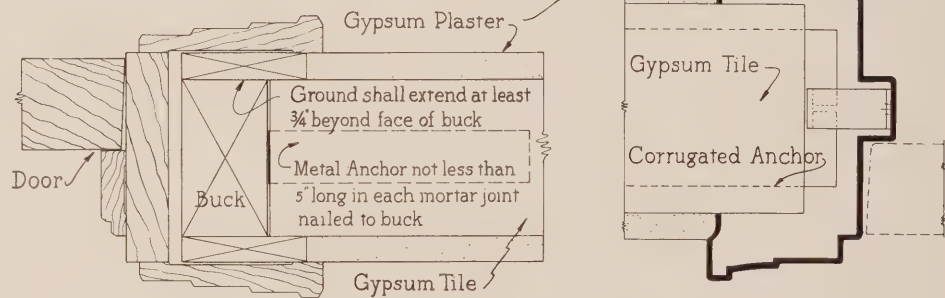
11. CONDUITS—Conduits shall be so placed as to allow the full thickness of the



GYPSUM PARTITION TILE CONSTRUCTION DETAILS



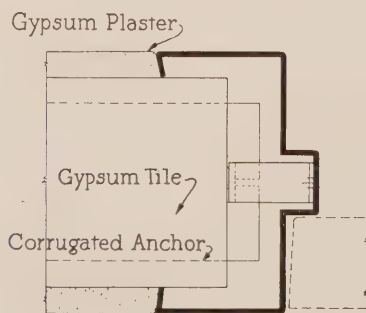
Wood Bucks extending to ceiling



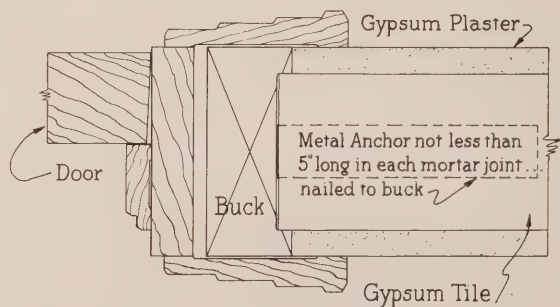
Door Jamb

Buck width of Tile with plaster grounds

Metal Buck, Jamb and Trim



Metal Buck and Jamb



Door Jamb

Buck rabbeted to receive Tile



plaster being applied. A strip of metal lath weighing not less than 2.2 pounds per square yard shall be applied over all conduit and pipe chases occurring in partitions.

NOTE—When conduits in partitions are placed within 12 inches of door bucks proper bearing of lintels can not be obtained. It is therefore recommended that a clause be inserted in the electrical specification requiring conduits to be kept at least 12 inches from the door bucks.

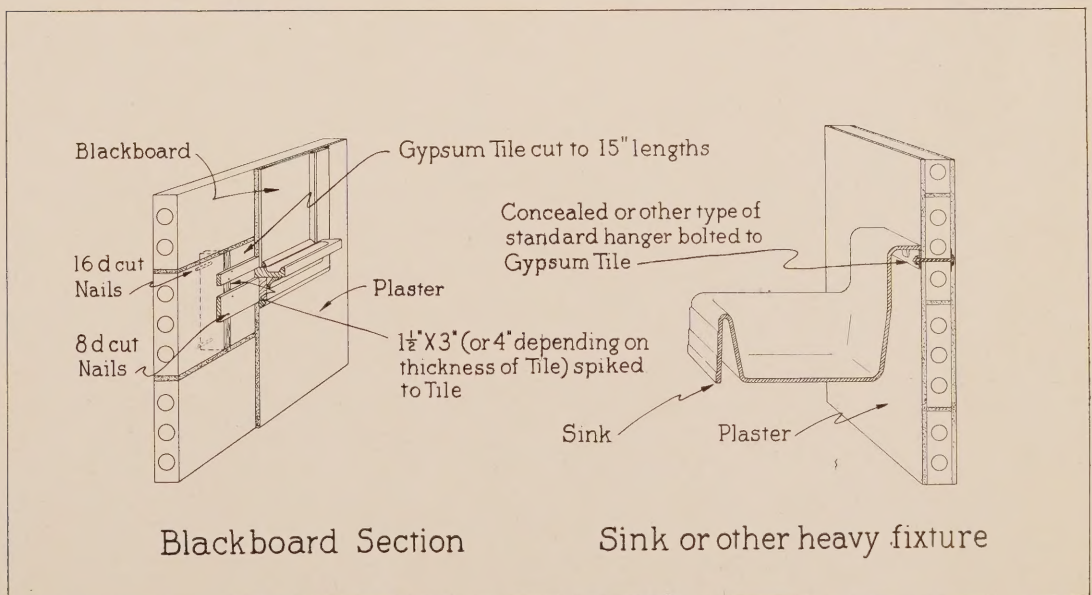
12. TRIM—(To be placed in Carpenters' Specifications.)

- (a) Baseboards, chair rails, and similar trim shall be secured to grounds or to nailing blocks or shall be attached by other approved means. Nailing blocks shall be furnished and placed by the carpenter contractor. They shall be not less than $\frac{7}{8}$ inch thick,

nailed directly to the end of the gypsum tile with square cut nails, and be of such other dimensions as to completely cover the end of the tile. When nailing blocks are used they shall be spaced not to exceed 30 inches.

NOTE—Conditions on the job vary this practice as sometimes the nailing blocks are furnished by the carpenter and set by the mason.

- (b) Where light trim is applied, such as picture molding, it may be toe-nailed directly into the tile with square cut nails.
- (c) Blackboards and heavy fixtures shall be secured by bolting through the tile construction with galvanized iron bolts, or shall be nailed to nailing blocks not less than $1\frac{1}{2}$ inches thick of the character required for other trim, and spaced not to exceed 15 inches.





SPECIFICATIONS FOR GYPSUM FIREPROOFING

1. COLUMNS

- (a) All interior columns and the interior parts of exterior columns projecting into the building beyond the interior face of exterior walls shall be protected with (2-inch solid gypsum tile) (3-inch hollow gypsum tile) (2-inch poured-in-place gypsum concrete) (state which). When gypsum tile is used it shall be set close to the steel without backfill.

NOTE—List and locate any special requirements not clearly indicated on plans and details. Note exceptions, if any.

- (b) Gypsum fireproofing shall start on the fireproof floor construction and be tightly wedged at the juncture of the fireproofing and the floor construction above. All gypsum tile shall be set on end with horizontal joints not more than 15 inches on centers.
- (c) Gypsum tile shall be well anchored by means of “U” shaped clips, $\frac{7}{8}$ -inch wide, made of 12-gage metal or by means of strips of 19-gage, galvanized wire cloth, placed in the horizontal joints or by other equivalent means of anchoring.

2. BEAMS, GIRDERS, AND TRUSSES

- (a) All interior structural steel beams, girders, and trusses shall be protected with (2-inch solid gypsum tile) (3-inch hollow gypsum tile)

(2-inch poured-in-place gypsum concrete) (state which).

NOTE—List and locate any special requirements not clearly indicated on plans and details. Note exceptions, if any.

- (b) The fireproofing of the lower flanges of beams and girders shall be provided by gypsum shoe or soffit tiles or by other gypsum units of the proper shape and size, securely bonded or attached to the flanges.
- (c) The webs of beams and girders shall be protected with (2-inch solid gypsum tile) (3-inch hollow gypsum tile) without backfill.

3. REINFORCING — When poured-in-place gypsum concrete is used, the steel members shall be wrapped first with a welded wire fabric composed of 14-gage wires, 4-inch by 4-inch mesh, or equivalent.

4. MORTAR—All gypsum tile fireproofing shall be laid up in gypsum mortar composed of 1 part gypsum to 3 parts sand by weight. Mortar shall be mixed in a clean mortar box.

NOTE—Do not use portland cement or lime.

5. ERECTION — All fireproofing shall be erected in strict accordance with standard details. All gypsum tile units shall be laid with full flush joints, true to line and plumb.

